



Hardy Fern Foundation Quarterly



Fall 2014

THE HARDY FERN FOUNDATION

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The Hardy Fern Foundation was founded in 1989 to establish a comprehensive collection of the world's hardy ferns for display, testing, evaluation, public education and introduction to the gardening and horticultural community. Many rare and unusual species, hybrids and varieties are being propagated from spores and tested in selected environments for their different degrees of hardiness and ornamental garden value.

The primary fern display and test garden is located at, and in conjunction with, The Rhododendron Species Botanical Garden at the Weyerhaeuser Corporate Headquarters, in Federal Way, Washington.

Affiliate fern gardens are at the Bainbridge Island Library, Bainbridge Island, Washington; Bellevue Botanical Garden, Bellevue, Washington; Birmingham Botanical Gardens, Birmingham, Alabama; Coastal Maine Botanical Garden, Boothbay, Maine; Dallas Arboretum, Dallas, Texas; Denver Botanic Gardens, Denver, Colorado; Georgia Perimeter College Garden, Decatur, Georgia; Inniswood Metro Gardens, Columbus, Ohio; Lakewold, Tacoma, Washington; Lotusland, Santa Barbara, California; Rotary Gardens, Janesville, Wisconsin; Strybing Arboretum, San Francisco, California; University of California Berkeley Botanical Garden, Berkeley, California; and Whitehall Historic Home and Garden, Louisville, Kentucky.

Hardy Fern Foundation members participate in a spore exchange, receive a quarterly newsletter and have first access to ferns as they are ready for distribution.

Cover design by Willanna Bradner

HARDY FERN FOUNDATION QUARTERLY

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QUARTERLY

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President's Message ~ Fall 2014

The fall color is beginning its annual show. Cooler nights, cloudier days and the fall rains are beginning. The long days of summer, here at near the 48th parallel north, are rapidly diminishing and sun is down now by 6 pm, and soon with the end of daylight savings time, we will be driving home from work in the dark. The ferns in the garden have freshened up with a sprinkling of early fall rains. Here in the Pacific Northwest, fall is the best time to plant. Lingering warm soil temperatures initiate root growth and the beginning of the rainy season alleviates the need to water. By the following spring the new plants have a good start in getting established and making it easier to survive the dryer summers that this area is noted for.

The HFF Fall Social and Potluck was held at the new Visitors Center at the Bellevue Botanical Garden this past Saturday, Oct. 11th. This is a time for HFF members and fellow fern enthusiasts to get together. Board member Arlen Hill, owner of Keeping It Green Nursery, gave a presentation of his trip to Sichuan and Guizhou Provinces in China, focusing on plants of that region. Beautiful photographs for which Arlen is renown, accompanied a most interesting subject. Thank You, Arlen. Back for the 2nd year was the Fern Frond Showcase, set up by Richie Steffen of the Miller Botanical Garden. Well over 100 stem vases, each holding a frond of a particular species or variant, were arranged beautifully on display tables. Over 100 ferns were represented where their specific morphology could be viewed, noted and compared with other ferns. This display, in one closed setting, makes you marvel in the great diversity of ferns and provides a great way to improve the identification skills. A special Thank You goes to Linda Pyles for chairing this event and for all her work in putting together what has now become a yearly HFF social event. Thanks to all those attendees for bringing a dish to put together a great potluck and for your goodcompany.

A few weeks ago I gave a presentation for the Northwest Horticultural Society on the Stumpery at the Rhododendron Species Botanical Garden. It has been five years since the stumps, logs, soil and paths were installed. The numerous fern species and varieties and companion plants planted, have since filled the stumpery, festooning rampantly on the vertical faces of upturned root masses stacked in uniquely contorted harmony and thriving on the ground and between logs and stumps. The class began with the attendees sitting on the long planed western cedar log situated along the upper path at the highest point in this garden, giving a nice overview of the entire half acre stumpery. It was a special moment for me to see the purpose of the sitting log realized.

This past August found our intrepid HFF founding member and fern advocate, Sue Olsen, along with a small group of fern advocates off to the Netherlands to attend a program to celebrate the 25th anniversary of the Netherlands Fern Society. Prior to the celebration they explored fern gardens in Germany. In this quarterly the celebration is summarized by the participants and members of the Netherlands Fern Society. Thank You to those writers for their time and expertise in contributing to the Quarterly and Thank You Sue for putting it together and adding to HFF's international associations.

Last week I planted 280 one gallon sword fern (*Polystichum munitum*) in a landscape, partly shady, with no summer water in our dry summers. This tough, robust, dramatic, large, evergreen, drought tolerant, easy to cultivate, beautiful, dependable, shade and sun tolerate fern is a plant I use extensively for all the wonderful attributes it has. The early fall rains have begun and so this plant will establish with little after care, and will slowly carpet a mixed planting of trees and shrubs bringing the scene into a cohesive whole. I find this plant to be one of the most valuable, versatile and indispensable plants for this area. May the fall planting spirit capture you and add a new fern acquisition to your garden.

Happy Fern Gardening.
John van den Meerendonk

From the Editor's Desk

Netherlands Fern Society Celebrates their Jubilee Anniversary

Naud and Wim Burnett, Kent Kratz, Loyd Jacobs and I from the US were amongst the international fern enthusiasts who were privileged to join the Netherlands Fern Society members as they celebrated their 25th anniversary at the Hortus Botanicus in Leiden, The Netherlands. We were graciously welcomed to this outstanding event which featured displays, lectures a tour of the botanical garden and completed the day with a social hour and refreshments (including wine bottled with a special label to celebrate the occasion.) In addition the foreign guests were treated to three days of private garden tours in The Netherlands and Belgium. It was a wonderful experience and with the help of the hosts (and their translators) this issue features the highlights of the celebration.

The botanical garden conservatory featured a summer display of ancient plants so it was quite an appropriate setting for a fern celebration. There were four lectures with quite varied topics (one was actually in English) which are presented here (in English!) The garden there has an extensive collection including two highlights for me.....a new hybrid between *Cystopteris* and *Gymnocarpium* (*x Cystocarpium roskamianum*) that was discovered by Harry Roskam, the President of the Netherlands Fern Society. My other favorite was a beautiful and massive display of *Woodwardia unigemmata* which had to be at least fifteen feet across!

This comes with many many thanks to our hosts and extra thanks to the contributors who so kindly prepared the articles for this volume.

I hope you enjoy this celebration.

Sue Olsen

Celebration of the 25th years Jubileum of the Nederlandse Varenvereniging

Fons Slot

Heemstede ~ The Netherlands

Two years ago a start had already been made to prepare the celebration of the 25th anniversary of the Nederlandse Varenvereniging. 2014 would be a Jubilee Year.

An interesting program could be developed, under the supervision by a Jubilee Committee, that would suit young and old as well as interested visitors and even fern experts should stay on their chairs.

Finally the Jubilee celebration could be fitted perfectly from August 16-24- 2014 within an already planned extensive Oerplantententoonstelling (exhibition about primitive plants) during April-November in the Hortus of Leiden.

The anniversary day, Saturday, August 16 began by welcoming numerous members and guests and interested people from the Netherlands, Belgium and even across the border: fern friends from South Africa, Switzerland, Germany, England and from America

After that an exhibition existing of more than 125 specially composed hardy ferns was opened to the public.

Then everyone could take place in the Orangerie, the former winter storage for exotics, which have been specially redesigned for making lectures and seminars possible in recent years.

The president, Harry Roskam, welcomed everyone and described the many developments from the founding of the society in 1989. He showed an old advertisement that was placed by the late fern enthusiast Joop Comijs in a Dutch magazine Groei en Bloei. He had copied the ad from the archives of the Society.

Finally the society was founded, it quickly became apparent that the Hortus of Leiden could become a meeting home for the society and several active members made a start with the realization of the construction of a fern garden in the early 90's.

The interest in ferns within the "lowlands" was enormous, the number of members increased steadily and even across the border, from the Flemish speaking part of neighbour country Belgium, soon the first members joined.



Front, Martin Rickard, back, Pat Acock at the Hortus Garden, debating the finer points of ferns.

Photo courtesy of Loyd Jacobs

Since then, every year, various activities and excursions and the issue of the magazine VarenVaria, of which the first copy was made by the late Joop Comijs on his typewriter a few times in triplicate and has reached 25 years later a circulation of 160 copies in full color printing and is sent by mail to the members three magazines with interesting stuff each year. An annual fern exchange among members offers everyone the opportunity to obtain new fern species.

After the opening speech by Harry's it became time for the first guest speaker Hans Steur, expert in the role which ferns played in the early days of plants on earth in terms of primitive plants. Hans gave a fascinating lecture on the first signs of life on earth, the development of plant species and all was joined with beautiful images of fossil ferns.

<http://steurh.home.zs4all.nl/engplant/eblad1.html>.

The second lecture was in English spoken by Rolf Thiemann about the occurrence of crossings (60%) in the fern flora of Europe and North America. Again, a fascinating lecture in which Rolf placed emphasis on the *Polystichum*, *Polypodium*, *Dryopteris*, and *Cystopteris*. The many photographs he showed completed his words very well. Incidentally, the interest of Rolf extends being busy experimenting to cross all naturally occurring hybrids, home in Germany by sowing spores and a remake of sporophytes.

In the meantime lunch was served for all guests, which was much appreciated by everybody. For all fern lovers lunchtime was also used to exchange ideas among each other extensively. And let's not forget the great interest for the exhibition of fern-decorative arts, made available by Fonz' collection, which all were manufactured in the Victorian times during the Fern Craze: Pteridomania was coined by Charles Kingsley, who wrote: 'Your daughters, perhaps, have been seized with the prevailing 'Pteridomania' and are collecting and buying ferns...and wrangling over unpronounceable names of species, (which seem to be different with every new fern that they buy), till the Pteridomania seems to you something of a bore.'

By the way, Pteridomania spread throughout the British Isles, The Empire and even America.

The first afternoon lecture was presented by Valentijn ten Hoopen, city-ecologist of Amsterdam, on the development of Rare Wall vegetation (ferns and flowering plants) on quays and docksides in Amsterdam from 1987 to 2013. He told us how since the early forties of the twentieth century research has been done on wall vegetation on quay- and docksides in Amsterdam.

The last lecture was given by Pier Bremer. He is PhD researcher and author of ferns in an ancient cultural landscape in the Netherlands.

Then it became time for a walk through the fern garden in the Hortus. Harry led everybody with “verve” through the fern wood landscape. One could hear a many oh’s and ah’s looking at many different fern species in this natural surrounding.

This jubilee was finished by a drink for all.

We are looking back on a very interesting day of ferns all over.

A Small History of the Ferns

Hans Steur

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Fossil plants: <http://steurh.home.xs4all.nl/home.html>

The emergence of ferns is best to be compared with a looming up from the fog. At first you see forms vaguely resembling ferns and bit by bit the image becomes sharper. And at last you are sure: this is a real fern. Usually a fern is defined as a free-sporing plant with sporangia evolving from the leaf. This is a usable definition for living ferns but this is not always the case for fossil ferns because for those one must rely on accidental remains.

Other characteristics of ferns can be:

- the young leaves are coiled up (mostly)
- there is no secondary wood
- the leaves are in most cases compound and pinnate (fronds)
- aphlebiae occur: these are leaflets with an aberrant shape attached to the base of a frond
- free gametophytes develop from the spores

According to the newest insights the horsetails and *Psilotum* also belong to the ferns, but here they are not taken into consideration.

Very old plants

The oldest fossils of land plants visible with the naked eye come from Ireland and date from the Middle Silurian (425 million years). These are very small plants up to a couple a centimeters high, called *Cooksonia*. No leaves, no flowers, no seeds, but only dichotomously forking little stems with a sporangium on top. See figure 1 for a somewhat younger specimen.

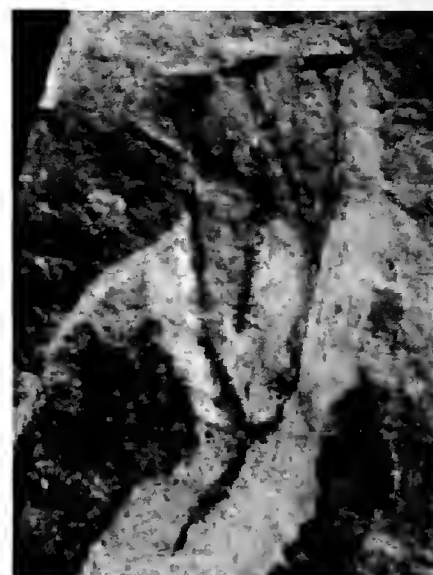


Figure 1

Near to the Scottish village of Rhynie a silicified flora has been found dating from the Lower Devonian (406 million years), which has been preserved superbly. Figure 2 shows a transverse section of a stem of 1.3 mm of the plant *Rhynia* in which every cell is clearly visible. *Rhynia* was a free-sporing plant without leaves and sized about 15 cm.

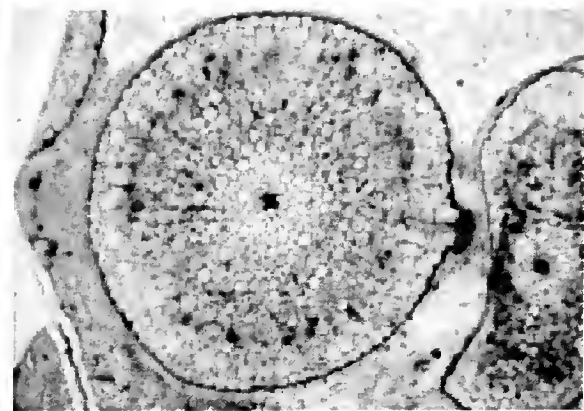


Figure 2

The group of very old plants like *Cooksonia* and *Rhynia* is often called Rhyniophyta.

It is a sister group of the clubmoss group, which developed also very early. During the Devonian (410 - 355 million years) a rather strange-looking flora evolved from the Rhyniophyta which must have included the ancestors of the ferns.

Gradually higher plants occurred: up to 50 cm in the Early Devonian, small trees in the Middle Devonian and tall trees (up to 10 m) in the Late Devonian. From the Middle Devonian on the first seed plants evolved. Real leaves appeared (only scarcely) in the Late Devonian.

Early fernlike plants

Rhacophyton

It is not known with certainty which Devonian plants were ancestors of the ferns. Several groups are mentioned but there is no common assent about it. Many of those ancient plants share characteristics with ferns but they have also characteristics of other groups, e.g. the conifers, like the presence of secondary wood.

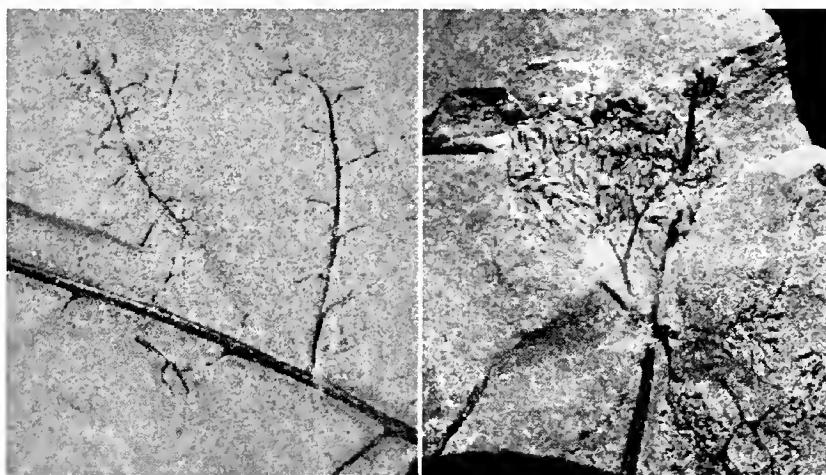


Figure 3

A plant apparently closely related to the ferns is *Rhacophyton condrusorum*, occurring among other places in Belgium (Fig. 3). This plant had a branching system with the main axis and the secondary branches lying in one plane and the further branchings being three-dimensional. The fact that the main axis and the secondary branches were situated in one plane, is interpreted as a preliminary stage in the formation of leaves: in earlier plants all axes formed a three-dimensional system.

The sporangia were growing in clusters. At the base of a side branch a deeply divided leaflet was attached, called aphlebia.

Rhacophyton may probably be considered as a stage in evolution less far evolved than the oldest real ferns. It is positively uncertain that this is a real intermediary stage in the evolution of ferns.

Zygopteridales

Plants from the extinct order of the Zygopteridales are commonly included into the early fernlike plants but some consider them to be true ferns. They have complex, paired leaves and branchings up to the fourth order (four times branched). They

appeared at the end of the Devonian (340 million years) and died out in the course of the Permian (200 - 250 million years). The group includes among others the genus *Alloiopteris* (Fig. 4). The *aphlebiae* in this group are interesting because they are branched many times and because they are three dimensional in some genera and planated in other ones. The plants in this group had true leaves but these were still small. It is thought that they were growing mainly in somewhat dryer places with plenty of light in the coal swamps. The groups described below contain in most cases also still living species. Taylor et al divides them in Marattiales (*Marattia*-like ferns), Ophioglossales (adder's tongue-like ferns) and leptosporangiate ferns. The extant ferns of the first group can be seen as living fossils. A vast majority of the recent ferns belongs to the third group. Botanists working on living material, are often using different classifications.



Figure 4

Ferns and seed ferns

At first sight the coal flora of the Upper Carboniferous seems to be very rich in ferns. This is, however, appearance, because most of the fernlike leaves come from gymnospermous plants. These are indicated with the confusing term 'seed fern'. They are, after all, not ferns but gymnosperms. The majority of the many fernlike fossils in the Upper Carboniferous originate from seed ferns. Only in the uppermost part of the Upper Carboniferous the true ferns become dominant.

Marattia-like ferns

These ferns, together with the adder's tongue-like ferns, used to be counted among the so-called eusporangiate ferns. These are ferns with relatively large sporangia with thick walls, producing many spores. The remaining ferns belong to the leptosporangiate ferns, characterized by a small, stalked and thin walled sporangium containing a much smaller number of spores.



Figure 6

Marattia-like ferns still occur in the tropics and are confined to the southeast of Asia. The most well-known representative of this group is the tree fern *Psaronius*. Beautiful silicified trunks of this tree have been found among others in the region of Chemnitz (Germany) where they date from the Early Permian (290 million years). The leaves are mostly found separate from the trunks, in different layers. They are called *Pecopteris* and they are characterized by the fact that the leaflets of the last order are feather-veined and are broadly attached to the axis (Fig. 6). *Marattia*-like fossils occur also in Jurassic sediments. An example is shown figure 7: it is a part of large compound leaf found in the region of Bayreuth (Germ.). The age is about 200 million years (lowest Jurassic). A species is also reported from the famous fossil flora of North-Yorkshire. This one is aged about 150 million years (Middle Jurassic). The resemblance between this fossil and the extant ones is so striking that it is justified to use the genus name *Marattia* also for the fossil.

Adder's tongue-like ferns

This group is also called Ophioglossales after the Latin name *Ophioglossum* for adder's tongue. Also the moonwort (*Botrychium*) and some other genera are members of this group. The plants have in most cases an undivided leaf and a separate spore spike. They grow in moderate and cold areas and form only a small group. This was the same in the past. Only very few fossils of this group have been found. The oldest among them date from the Paleocene (60 million years): thus relatively young.

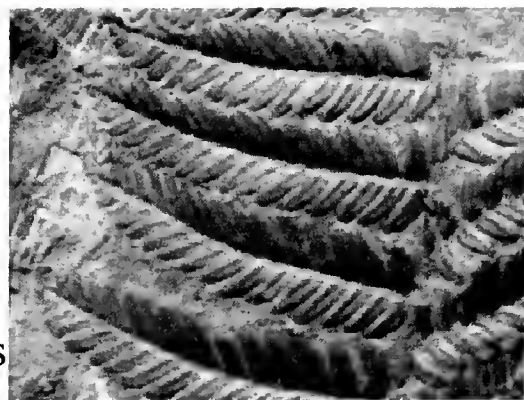


Figure 7

Leptosporangiate ferns

As said before, most of the living species belong to this group: about 11,500 species divided over 300 genera. Most of these ferns have pinnate leaves, but a few have undivided ones. The sporangia are always united in sori. There are too many groups to describe here, but I'd like to say something about some of them of which fossils also have been found.

Osmundales

An ancient order is the one of the Osmundales or the royal ferns. This one is going back to the Permian (250 - 200 million year). There are still three extant genera in this group: *Osmunda* (royal fern), *Todea* and *Leptopteris* with together 16 species, whereas there are 150 fossil species known. An example of such a fossil is *Todites* from the Jurassic of North-Yorkshire (Fig. 8). From the Cretaceous on (70 million years ago) fossils have been found resembling the modern royal ferns so much, that they are incorporated in the still living genus *Osmunda*. It seems that the dimorphism in the royal fern (sterile leaves and separate spore spikes) has come into existence only rather recently.



Figure 8

Schizaceae

The origin of this family probably lies in the Jurassic. *Klukia* is a rather common form genus within this group. The climbing fern *Lygodium*, which has nowadays leaves without blades up to 10 m long, is also a member of this family. We have found leaf parts of *Lygodium gaudinii* from the Oligocene of the south of France (30 million years).

Dicksoniaceae

In this family of tree ferns five existing genera are distinguished among which the prehistoric looking *Dicksonia* tree. Many of these plants have hairs and scales on the leaves and the rhizomes (i.e. the horizontal growing subterranean axes). The sori can be situated near the margin of the leaf, but in other species they are covering the whole back of the leaf. Fossils of these plants are known from the beginning of the Jurassic (200 million years). An examples of a fossil is *Coniopteris* (Fig. 9) from the Middle Jurassic of North-Yorkshire (150 million years).

Matoniaceae

This family still contains two extant genera: *Matonia* and *Phanerosorus*. The leaves of *Matonia* are composed like palm leaves.

In the Mesozoic plants of this family were rather common, but only with a limited number of species. An example is the genus *Phlebopteris* from the Lower Jurassic of the Bayreuth region (200 million years).

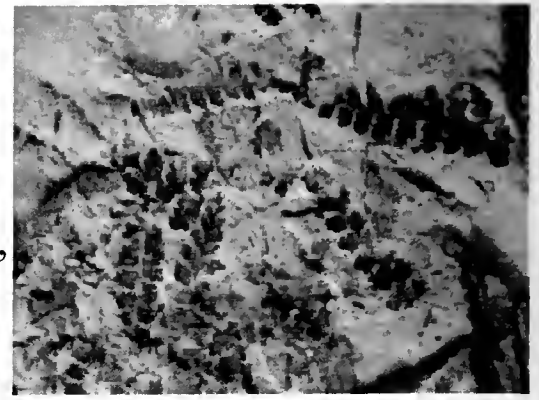


Figure 9

Dipteridaceae

Two genera remain nowadays from this family: *Dipteris* (11 species) and *Cheiropleuria* (1 species). The leaves often show a reticulate venation, reminding somewhat of modern flowering plants. An example of a fossil is *Dictyophyllum* (Fig. 10) from the Lower Jurassic of Bayreuth (200 million years).

Polypodiales

This order, named after the polypodies (*Polypodium*), includes many known genera and goes back till into the Cretaceous. About 80% of all now living ferns belong to this group, which is considered to be one of the most 'modern' ones. In the root mantle of the tree fern *Tempskya* from the Upper Cretaceous (90 million years) rootlets have been found of a fern from this family.

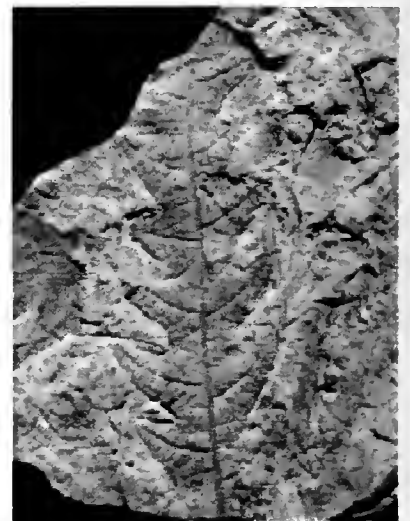


Figure 10

Salviniales

Fossils of these intriguing water ferns are found in Czech. (see photo page 70 and figure 11) They resemble the modern *Salvinia* very much. Their age is about 20 million years. The order originate possibly from the late Cretaceous (80 million years).

Conclusion

Within the group of the true ferns three radiations (periods of coming in existence of new types) occurred in the course of time.

- in the Paleozoic: especially during the Carboniferous many new groups came into existence
- in the Late Permian and the Early Triassic: before and after the great extinction at the end of the Permian (250 million years) many of the modern families developed
- in the Late Cretaceous and the Paleocene: before and after the great extinction at the end of the Cretaceous (65 million years) the advanced modern families and the modern genera appeared. This development was more or less synchronic with the rise of the flowering plants (angiosperms). It is certainly possible that new niches were created as a consequence of the changes, which offered possibilities for new fern species.

In most cases ferns have been of modest importance in the history of the flora, probably caused by their dependence on humid habitats. Still, there has been a period during which they were quite dominant. This was directly after the impact of the huge meteorite at the end of the Cretaceous (65 million years ago). Research on fern spores

and pollen has revealed that ferns have covered the whole earth during a period of 10,000 to 100,000 years. Afterwards the flowering plants took the lead again.

Literature

Taylor, T.N., Taylor E.L. & Krings, M., 2009. *Paleobotany: The Biology and Evolution of Fossil Plants* [2nd Ed]. New York: Academic Press.



Figure 11

Figures

1. *Cooksonia pertoni* with sporangia. South Wales, Upper Silurian. Height of the plant 3 cm.
2. Transverse section of a stem of *Rhynia gwynnevaughanii*. Diameter 1.3 mm. Rhynie (Scotland). Lower Devonian (408 million year).
3. *Rhacophyton condrusorum*. Left: final branchings. Width of the photo 7 cm. Right: clusters of sporangia. Width of the photo 2 cm. Liège (Belgium). Upper Devonian (365 million year).
4. *Alloiopteris* sp. (Zygopteridales). Lower Carboniferous (330 million year). Missouri (VS). Width of the photo 7 cm. Photo Hans Kerp.
6. *Pecopteris polymorpha* (Marattiales). A fern from the Upper Carboniferous (305 million year) of Graissessac (Fr). Width of the photo 5 cm.
7. *Marattiopsis intermedia* (Marattiales). Part of a large frond from the Lower Jurassic (200 million year) of Bayreuth (Germ.). Height of the photo 6 cm.
8. *Todites williamsonii* (Osmundales). Leaflets with sori. Middle Jurassic (150 million year). North-Yorkshire (Eng.). Height of the photo 2.6 cm.
9. *Coniopteris hymenophylloides* (Dicksoniaceae). Middle-Jurassic (150 million year). North-Yorkshire (Eng.). Width of the photo 6 cm.
10. *Dictyophyllum nilssonii* (Dipteridaceae) from the Lower Jurassic (200 million year) of Bayreuth (Germ.). Height of the photo 9 cm.
11. *Salvinia*, fossil and extant. On top: *Salvinia reussi* from Czech, Miocene (20 million year).

Visit our website at www.hardyferns.org to find out how you can help support the Hardy Fern Foundation by donating to our Fall Campaign. The HFF relies on the generosity of our members, friends and supporters. Please consider making a gift to the Hardy Fern Foundation today.

Creating fern hybrids

Rolf Thiemann ~ Altena, Germany

So far as I can remember to my early days as child I was fascinated by nature and especially by living plants. Later my interest focused on the cryptogamous vascular plants (horsetails, clubmosses and ferns). More than 30 years ago I began to collect ferns, at first the native ferns of Germany and Middle Europe. Later I bought hardy ferns from around the world to advance the collection. The occasions were limited because internet was not in general use at that time and we had only two fern nurseries in Germany at the end of the 90th. It was also difficult to get the rare hybrids: They could not be found or had been so rare that it was unsuitable to take them from nature. Sighting two magnificent *Polystichum* hybrids (*P. x bicknellii* in the show garden of the former nursery Lintner in Niederoffleiden and *P. x luerssenii* in Austria's nature) let grow the motivation to do all work to create them artificially – equal how the difficulties might be. In the same time I saw in the Bavarian Alps one specimen of the hybrid *Polystichum x illyricum*, the cross between *P. aculeatum* and *P. lonchitis*. I counted the parent plants round the area and found 25 plants of *P. lonchitis* and 40 of *P. aculeatum*. Therefore I was optimistic that I would get one or two hybrids if I would sow the spores of both parents together and then breed 100 plants. I started with this work in 1998 and my first goal was *Polystichum x bicknellii*, the hybrid between *P. aculeatum* and *P. setiferum*. The result was five hybrid plants. This great success resulted from the fact that *P. x bicknellii* is a backcross because the parent *P. aculeatum* arose a long time ago by chromosome doubling from the hybrid *P. setiferum x lonchitis*. So *P. aculeatum* shares two of its four genomes with *P. setiferum*. Therefore backcrosses are generally easier to realize than other combinations. In the following years I continued the work and could create *P. x wirtgenii* (*P. setiferum x braunii*) and *P. x luerssenii* (*P. aculeatum x braunii*). Both are very magnificent plants of strong hybrid vigour. Until now I have created 30 different hybrids mostly in the genera *Polystichum* and *Asplenium*. In the year 2000 I changed the method of creating hybrids. Since then I have sown the spores from both parents separately and pricked out the prothalli later in rows or rows of pairs together. There are also other methods to put the prothalli successful together. They all are described here:

Method 1

The easiest method: The spores of both parent species were sown together. The disadvantage of this method is that it gives a lot of plants which must be bred until it is possible to see a result.

Method 2

In this and the following methods the spores of the parents were sown separate. Later the prothalli were pricked out in a row and in the row alternating species A and species B.

Method 3

In this method the prothalli were pricked out in pairs.

Method 4

This is the chess-board method and was used by T. Reichstein in Basel, Switzerland. In this method each prothallus is surrounded by four prothalli from the other species.

Method 5

In this method we prick out the prothalli which are chosen as mother prothalli in a chess-board pattern and sow then the spores of the other species over them.

Method 6

We prick out the mother prothalli as in the previous method. After this we put a cluster of the other prothalli in water. Now the spermatozoids begin to swim out of the antheridia. After some hours we examine with a microscope whether that has happen. If so, we dab the water with a brush onto the mother prothalli. If not, we must wait a week and try it again. That must be repeated so long until sperms are to see under microscope.

General directions

Normally hybridizing is possible only between species which belong to the same genus. It is not possible to cross a *Polystichum* with a *Cystopteris*.

Spores should be sown very thin to get well developed prothalli which can be separated well when they will be pricked out. Dense sowing results in a strong jungle of small prothalli and then it is very difficult to prick out single ones and not clusters.

Pricking out the prothalli must be done in that way that it is impossible that the spermatozoids can reach a prothallus of its own species. To avoid fructification with the same species the prothalli must be placed in a minimum distance of 1".

On the gametophytes normally first ripen the antheridia with the spermatozoids and later the archegonia with the eggs. Therefore it is possible that all pricked out prothalli get ripe antheridia at nearly the same time and the sperms don't find a ripe egg. Later the archegonia get ripe and the eggs are waiting unsuccessful for fertilizing. The result is that for a long time no sporophytes arise. To avoid this it is best to decide before sowing the spores what species should be used as mother and what as father. The spores of the mother species should be sown two months earlier than that of the father species. So the chance is greater that the sperms will find a ripe egg. Important: Apogamous species can only be used as father because their prothalli produce only antheridia.

Some samples of my self-made hybrids:

Polystichum acrostichoides x aculeatum

This is one of my early successes. The plants resemble *P. aculeatum* but the color of the fronds is more bluish green and the fronds have a silky shining.

Polystichum x lesliei

This is the cross between *P. setiferum* and *P. munitum*. Long slender pinnae with many pinnules which are more or less adnate to the costa give the plant an elegant look.

Polystichum x arendsii - (see photo page 71)

This is the cross between *P. aculeatum* and *P. munitum*. Plants have the same shape as the former mentioned hybrid and show magnificent hybrid vigour. The fronds are more coriaceous than in *P. x lesliei*.

Polystichum x potteri

This is an American native hybrid which has *P. braunii* and *P. acrostichoides* as parents. The most prominent property is the wonderful apple-green color of the fronds.

Asplenium billotii x rhizophyllum

This hybrid combines the North American *A. rhizophyllum* and the European *A. billotii*. It produces no bulbils but surprisingly it is fertile. The plant looks like a *Polypodium* with a long tip. Snails and slugs love it in the same way as *A. rhizophyllum*. (Photos continued on page 83).

*x Cystocarpium
roskamianum*

Photo left courtesy of
Harry Roskam



*Woodwardia
unigemmata*

Select form at the Koen
van de Berg Garden

Photo right courtesy
of Sue Olsen



Salvinia

Photo left courtesy of
Hans Steur

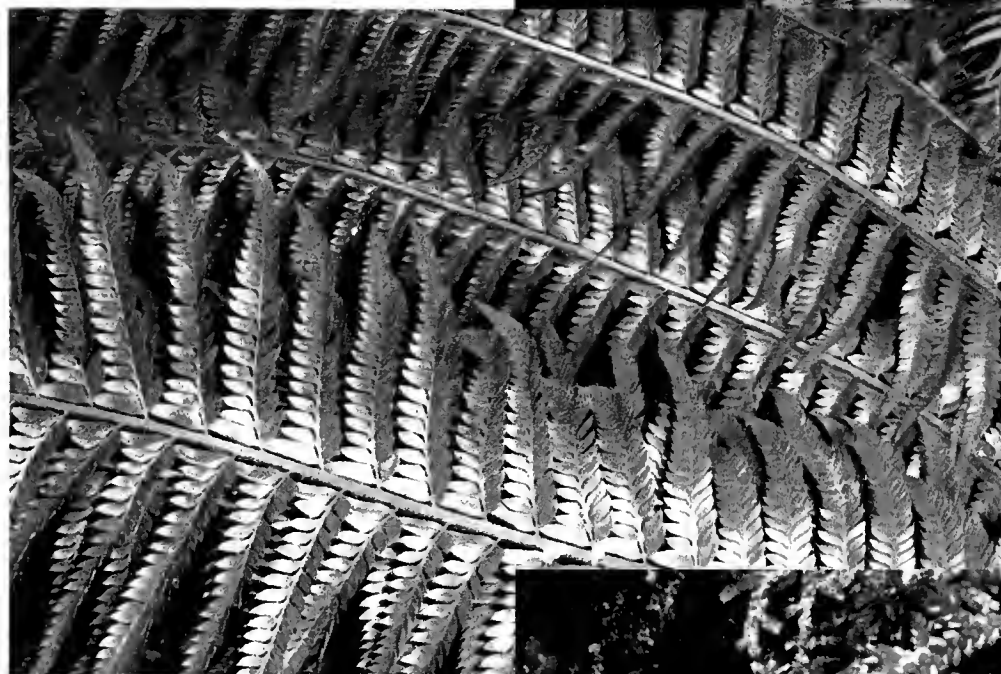
**Garden of Dirk
and Vera Ampe**

Photo right courtesy
of Loyd Jacobs



Canal at Ren Huiber's Garden

Photo right courtesy
of Loyd Jacobs



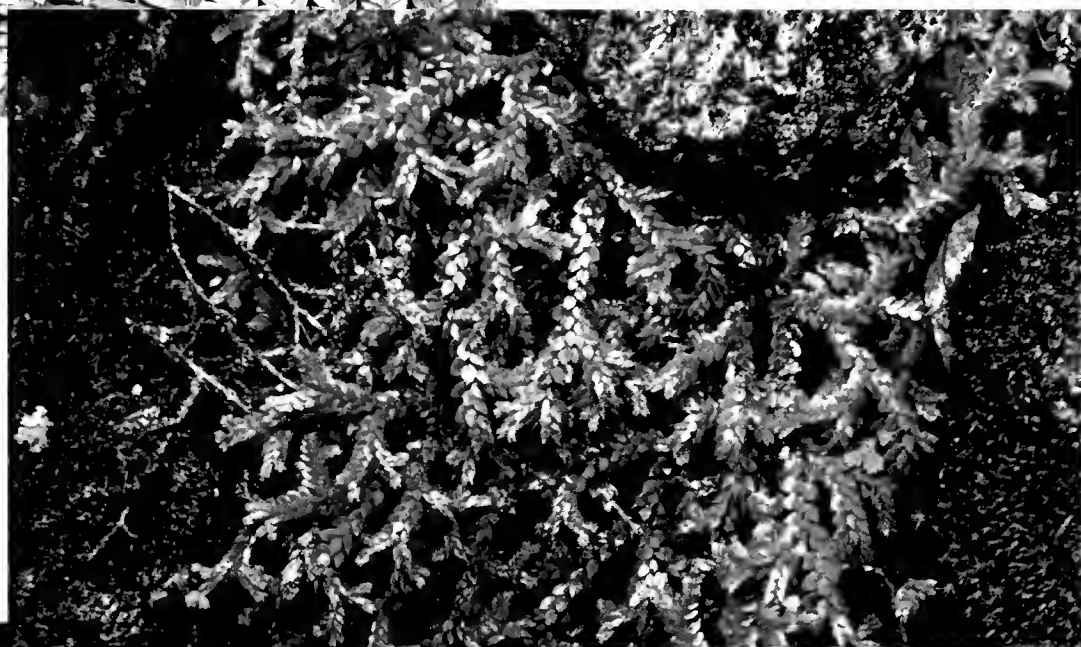
Polystichum x arendsii

Photo left courtesy of
Rolf Thiemann

Doodia

In the garden of
Annie de Pina

Photo below courtesy
of Loyd Jacobs



Selaginella denticulata

In the garden of Rens
Huiber's

Photo above courtesy
of Loyd Jacobs

Developments on ferns 1987-2013 in Amsterdam, Netherlands

Muurplantenwerkgroep Koninklijke Nederlandse Natuurhistorische Vereniging (KNNV) Amsterdam

Research protected ferns in Amsterdam 1987-2013

Polypodium vulgare as epiphyte in Amsterdam 2002-2014

Valentijn ten Hoopen ~ Amsterdam, The Netherlands

SUMMARY – Rare Wall vegetation (ferns and flower plants) on canal quay and docksides in Amsterdam 1987-2013

Since the early forties of the twentieth century research has been done on wall vegetation on canal quay- and docksides in Amsterdam.

In 1988 legislation was made for thirteen species by the Dutch government, in order to protect their habitat. Already the Research and Advise group Wall vegetation Northern Holland had started (1987) there annually research on some 57 miles (92km) of Amsterdam waterways.

Since 2003 all results are shared with the Amsterdam City Counsel and put in the Kennissysteem Muurplanten Amsterdam (Knowledge System Wall Vegetation Amsterdam by dienst Ruimtelijke ordening, Werk en Adviesgroep Muurplanten Noord-Holland & BenD natuuradvies) at www.maps.amsterdam.nl/muurplanten/ . When construction is planned on canal quay and docksides there must be a check on protected plants by the constructors before they can start to work.

In 2013 ten of the thirteen protected species were found in Amsterdam. From the protected species *Asplenium trichomanes* (8000 plants) and *Asplenium scolopendrium* (2400 plants) are the most abundant in Amsterdam. *Asplenium viride* and *Cystopteris fragilis* are the rarest on Amsterdam canal quay and docksides.

New for Amsterdam is the research on *Polypodium vulgare* L. (Common Polypod) as epiphyte. From 2002 epiphytic forms of *Polypodium vulgare* have been seen on *Acer platanifolia*, *Platanus acerifolia*, *Pterocaria fraxinifolia*, *Ulmus carpinifolia*, *Ulmus glabra*, *Ulmus x hollandica* 'Belgica', *Ulmus x hollandica* *Vegeta* and *Ulmus minor* in the inner-city and 20th century suburbs of Amsterdam. Research on this new phenomenon has started in 2010.

Valentijn ten Hoopen et al.2014,
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Historic research on wall vegetation in Amsterdam 1942-2014

The 'Muurplantenwerkgroep of the KNNV



KNNV excursion to the Amstel locks (2001)

Amsterdam researches and collects data biennially from wall vegetation of Amsterdam canal quays and docksides, bridges and locks in the old tradition of quayside research by Nederlandse Jeugdbond voor Natuurstudie (Grachtenkantenrapport 1956), Sam Segal (Ecological notes on wall vegetation 1969, dissertation) and the Werk en Adviesgroep Muurplanten Noord-Holland (Muurplanten in Noord-Holland 1990) since the 20th century.

Focus on protected species

The focus of the research lies on protected wall plants, ferns and seed plants (Natuurbeschermingswet 1991) and on accompanying species that predict the coming of protected species. (Denters, 2004)

Protected species found in Amsterdam in the period 1987-2013 are:

Asplenium adiantum-nigrum, *Asplenium ceterach*, *Asplenium scolopendrium*, *Asplenium trichomanes*, *Asplenium viride*, *Catapodium rigidum*, *Cystopteris fragilis*, *Erysimum cheiri*, *Gymnocarpium robertianum*, *Osmunda regalis*, *Parietaria judaica* and *Pseudofumaria lutea*.

Accompanying species in the period 1987-2013:

Asplenium fontanum, *Asplenium septentrionale*, *Centranthus ruber*, *Cyrtomium falcatum*, *Cyrtomium fortunei*, *Erigeron karvinskianus*, *Ficus carica*, *Gymnocarpium dryopteris*, *Polypodium interjectum*, *Polystichum aculeatum*, *Polystichum setiferum*, *Pteridium aquilinum*, *Sedum rupestre*, *Trachelium caeruleum*, *Thelypteris palustris* and *Umbilicus rupestris*

Ferns present on brick or basalt?

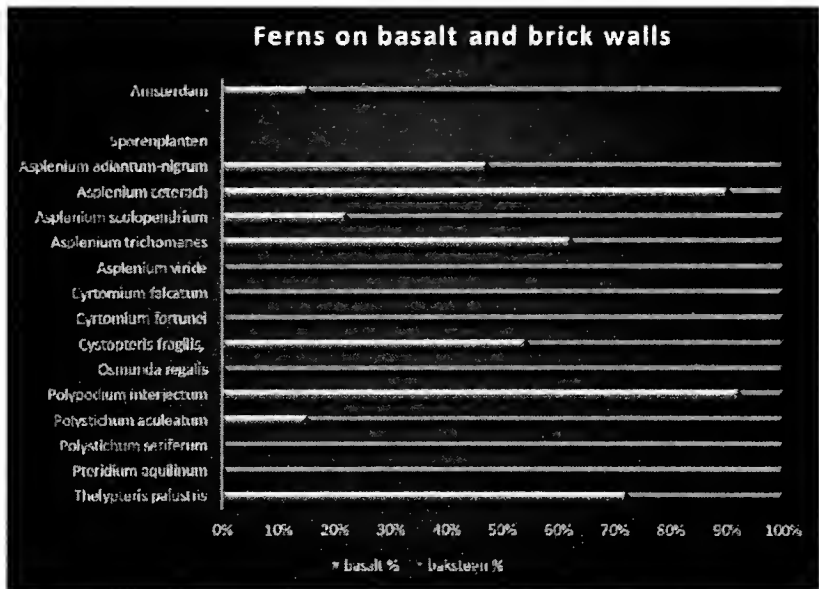
The Amsterdam quay and dockside system consists of brick (78km) and basalt (14km) raised water retaining walls. Basalt docksides are up to 120 years old and are found along the harbour in Amsterdam. On these basalt docksides large *Asplenium trichomanes* and *Asplenium ceterach* populations are found.

Brick walls on quaysides in the inner city and Westley suburbs are periodically replaced and renovated. Most quaysides are in the age of 50-70 years old, remnants of the old system of canals are to be found on bridges and locks and at the water bordering residential and warehouses of 16th, 17th, 18th and 19th century. On these brick walls we find populations of *Asplenium adiantum-nigrum*, *Asplenium scolopendrium* and *Asplenium trichomanes*.

Research on protected ferns in Amsterdam, period 1987-2013

Since 1987, research is done on the distribution of protected ferns in Amsterdam, data is collected biennial.

The canals and quay walls are inspected from above and hard-to-reach spots are counted with binoculars. Inspection is always done in September and October. This method of inspecting the walls is the standard procedure of the research group, existing



Distribution of ferns on brick and basalt walls in % (data 2003-2013) in Amsterdam. ©2014 Muurplantenwerk-groep KNNV Amsterdam

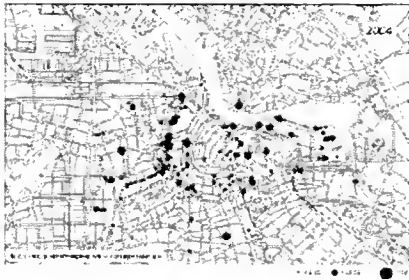
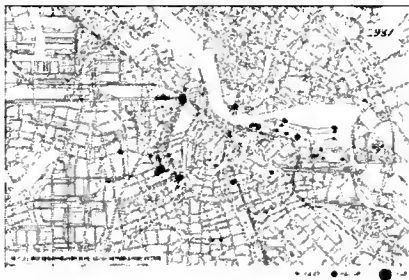
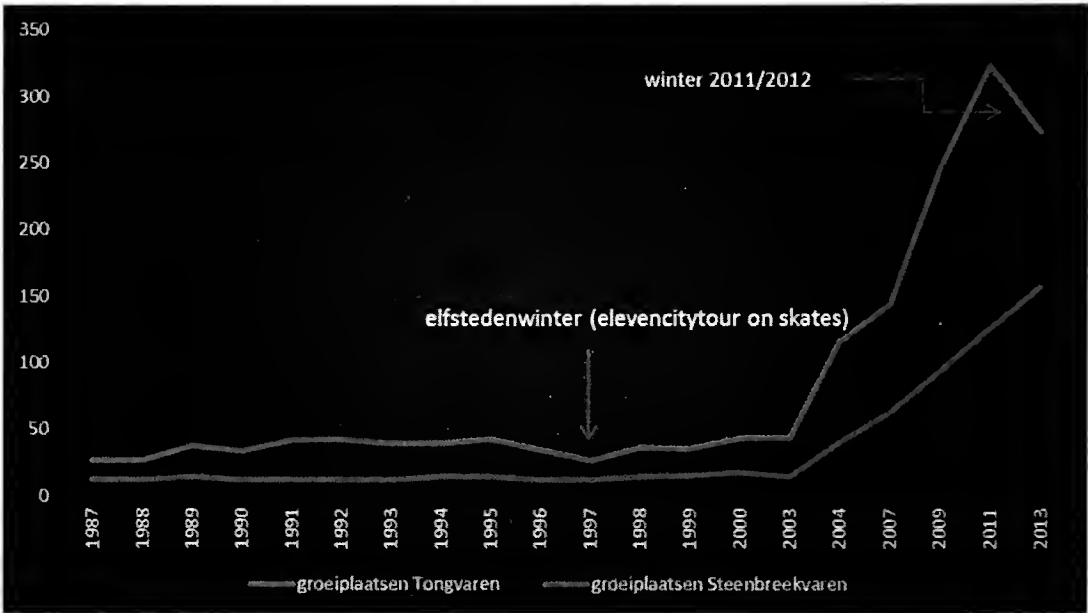
of seven members since 2003, and therefore very reliable. Data of populations and single ferns is signed in on maps (1:1000) of the City Council. It is possible singe in the growth place in the field on two meters accurately. When the data is processed, at each growth place a Geophysical Information System number is connected with a latitude en longitude (Dutch quadrant). All data, about 750 data numbers each biennial research, is put in the ‘Kennissysteem Muurplanten Amsterdam’ and is to be seen at www.maps.amsterdam.nl/muurplanten. Furthermore the research group produces every two years a paper with the latest findings. (<http://www6.knnv.nl/amsterdam/MUURPLANTEN%20GRACHTENKANTENRAPPORT.PDF>)

Long-term research on *Asplenium scolopendrium* and *Asplenium trichomanes* (1987-2013)

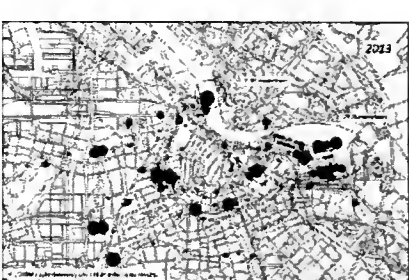
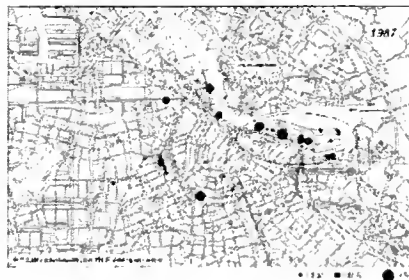
For *Asplenium scolopendrium* and *Asplenium trichomanes* there is an annual long-term graphic made over the period 1987-2014. The influence of harsh winters is seen and especially the turning point of the great expansion of the populations at the turn of the century. *Asplenium scolopendrium* and *Asplenium trichomanes* profited from warm winters and humid summers in the last eleven years.

(Graph right)

Asplenium scolopendrium and *Asplenium trichomanes* grow places per year for the inner-city of Amsterdam (1987-2013) Dock sides of the Amsterdam harbour excluded ©2014 Muurplantenwerkgroep KNNV Amsterdam



Distribution of *Asplenium scolopendrium* 1987-2004-2013 in Amsterdam
© 2014 Muurplantenwerkgroep KNNV Amsterdam



Distribution of *Asplenium trichomanes* 1987-2004-2013 in Amsterdam
© 2014 Muurplantenwerkgroep KNNV Amsterdam

***Polypodium vulgare* as epiphyte in Amsterdam 2002-2014**

Since the turn of the century observations have been done of *Polypodium vulgare* as an epiphyte in *Ulmus minor* in Amsterdam.

The reduced emissions of sulphur dioxide (SO₂) (van Dam et al, 1986), the increase in ammonia (NH₃) deposition and warmer winters since the late eighties of the last century (Sparrius & van Tooren, 2007) has made a positive contribution to the formation of the prothallia of *Polypodium vulgare* on *Ulmus minor* (Bremer, 2011). Following the accumulation of observations of epiphytic *Polypodium vulgare* in 2010 systematic research has started on the *Ulmus* of the inner-city of Amsterdam (ten Hoopen et al, 2010). In the inner city of Amsterdam there were 2500 elms checked. Plant year (the youngest elms with *Polypodium vulgare* were planted in 1960), exposition of the epiphytes and moss and lichen cover have been looked at and noted. A follow-up study was held in 2011 in the 20th century suburbs of Amsterdam. Surprisingly *Polypodium vulgare* epiphytes were found in *Platanus acerifolia*, *Pterocaria fraxinifolia* and *Acer platanifolia*.

In the winter of 2014/2015 an all Amsterdam follow up study will be done to determine and chart the development of epiphytic *Polypodium vulgare* in Amsterdam trees.

Distribution of *Polypodium scolopendri* as an epiphyte in the inner city of Amsterdam 2010-2014



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Notes:

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Denters, T. (2004). Flora-beschermingsplan, beschermde en kwetsbare bijzondere plantensoorten in Amsterdam. Amsterdam.

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Ferns as ancient woodland indicators?

Some species analysed in more detail in Overijssel, the eastern part of the Netherlands.

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Ancient woodland

Numerous herbaceous plant species characterise the ancient woodlands and forest of Europe and indicate a long woodland history and undisturbed environmental conditions. Peterken (1974) was the first to list a number of Ancient Woodland Indicators (=AWI) and subsequent studies showed these indicators to be found in many European countries (Wulf 1997), but also in the USA (Flinn & Marks, 2004). AWI species are prone to seed limitation because seeds are only dispersed over (very) short distances. Life history traits such as short seed dormancy, low seeding establishment rates, slow individual growth and long pre-reproductive periods, may also contribute to a low chance of establishment. These species show low ability in colonizing recent isolated woodlands (Bremer & Smit 1999) or are sensitive to woodland fragmentation. Their moment to colonise recent woodlands is related to woodland size, isolation (distance to source population) and the size of source populations (Brunet 2004, Rackham 2003, Hermy *et al.*, 1999), but habitat quality also plays a role, as recent woodlands often have high levels of nutrients facilitating competitive species such as *Rubus fruticosus* and *Urtica dioica* (Brunet 2004).

Spore producing plants species, including ferns, are able to produce large numbers of spores, which can be transported over large distances. The Kuinderbos, a plantation on a former sea-floor, was colonized by 31 fern taxa, including four species and two hybrids not known before from the Netherlands. Most of these species colonized the area within 20 years after ploughing the soil and planting trees. Some species were transported over long distances, e.g. *Polystichum lonchitis* from Scotland or Central Europe (Bremer 2007). By self-fertilization the first generations of fern plants were able to set up populations and increased outcrossing rates have boosted local abundances in some species. Genetic studies in four species of ferns (e.g. *Asplenium scolopendrium*, *Polystichum setiferum*) showed that the Kuinderbos population originated from areas all over Europe and that isolated habitat patches may regularly receive spores from multiple distant sources (Wubs *et al.*, 2009, de Groot 2011).

Peterken (1974) listed ancient woodland indicators, including *Polystichum aculeatum*. Brunet (2004) found *Gymnocarpium dryopteris* to grow exclusively in ancient woodland, while *Dryopteris filix-mas* and *Athyrium filix-femina* were significantly more frequent in ancient oak woodlands (at least 300 years old) than recent oak plantations (7 – 84 years old). Rose (1999) listed 120 AWI, including 12 species of ferns and horsetails (e.g. *Asplenium scolopendrium*, *Polystichum aculeatum*). The list was based on published literature and the view of a number of experienced field botanists. Honnay *et al.* (1998) surveyed hundreds of ancient woodlands in Flanders. They found *Blechnum spicant*,

Equisetum sylvaticum, *Osmunda regalis* and *Pteridium aquilinum* significantly related to ancient woodlands. Data on these four species were analysed in more detail from Overijssel, in the eastern part of the Netherlands, a province having much in common with Flanders (e.g. climate, dominance of sandy deposits).

Method

A detailed inventory of vascular plants took place in Overijssel in the period 1983 – 2006 including a fine detailed mapping of 32 species of ferns and horsetails. The present day habitats have been linked with the former conditions by using geo referenced historic maps of 1783 (Hottinger map), 1840 (the first topographic and military map) and 1900 (www.atlasoverijssel.nl). ArcGIS was used for some analyses.

Bracken

In Twente (eastern part of the Netherlands) *Pteridium aquilinum* was found significantly more in the ancient countryside as in the planned countryside. This fern species was also able to colonize drained bogs, probably after fire. In Salland 227 sites were analysed, 68% related to ancient habitats such as woods and wooded banks or patches were thriving at places where in the last 250 years these habitats had been lost by cultivation. They survived in road verges or dry ditch sides because of their persistent rhizomes. 21% of the clones were found in the planned countryside, often in woodlands planted on former heathland. In the Netherlands *Pteridium aquilinum* does not grow in heathland, indicating colonisation after ploughing, fertilisation and planting the heathland. These clones are at average smaller than those found in the ancient countryside.

Other fern species

Of the three other species mentioned by Honnay *et al.* (1998) *Equisetum sylvaticum* is known from 28 locations in Overijssel. 71% of these sites are on former heathland, which were cultivated and planted with trees at the end of the 19th century or first decades of the 20th century. 29% of the clones thrive at ancient wooded banks or sites that have a history with wooden banks. *Equisetum sylvaticum* has not been found in ancient woodlands. So, the status as AWI in other countries can't be confirmed in this Dutch study. Bremer (2010) reconstructed the colonization of *Osmunda regalis* in detail in the western part of Overijssel. In the 17th century populations lived in coppiced woodland and dikes. In the 19th century young railway banks were colonised. In the subsequent decades dry ditches were colonised, while after 1992 *Osmunda regalis* was shown to be a successful pioneer on former farmland which had been turned into nature areas by sod cutting. There is hardly any relation with ancient woodlands or wooded banks. *Blechnum spicant* has been found significantly more in the planned countryside, especially at steep dry ditch banks within plantations on cultivated heathland. It was only found in 1.7% of the ancient woodlands, also indicating this species not to be an AWI.

Remarks

For what reasons does *Pteridium aquilinum* behaves as an AWI? In the Netherlands and other European countries the spore production is highly variable. High spring and summer temperatures and light availability promote spore production (Kendall *et al.*, 1995). The spores are transported over long distances, so spore limitation does not play

a role and the species is found in spore banks (Esteves & Dyer 2003). Prothallia and young sporophytes are susceptible to drought and frost (Conway 1953), which limits the establishment in the Netherlands. Den Ouden (2010) observed high germination rates in continuously moist and nutrient-rich substrates in greenhouses, so the climate plays a role. In his study in Finland Oinonen (1967) found that spore regeneration was almost entirely connected with fire. The release of nutrients (potassium) and rise of pH facilitates spore germination and the growing of prothallia and sporophytes (Page 1982). For that reason *Pteridium aquilinum* is able to colonise drained bog areas after wildfire and burning. During years of intensively investigated field populations Den Ouden (2010) never encountered sporophytes on sandy and acid soils. But in Overijssel (Salland) 21% of the sites were in the planned countryside in young plantations on sandy soil. *Pteridium aquilinum* probably colonised former heathland soils after ploughing and a rise in pH after fertilisation, but the role of fires can't be ruled out.

There are also establishments on dikes and sandy, calcareous flats elsewhere in the Netherlands where it established after disturbance. The same holds for the Kuinderbos, where during 35 years of intense monitoring *Pteridium aquilinum* was found at seven sites, mostly related to recent thinning or tree fall within Sitka spruce plantations and disturbance of soil with high pH (Bremer 2007).

It is concluded that in the ancient countryside, with acidified woodland soils and without recruitment *Pteridium aquilinum* is an AWI. For that reason I have used this species within the ancient woodland inventory of Overijssel.

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X *Cystocarpium roskamianum*, a weird one?

Harry Roskam

Chairman Nederlandse Varenvereniging

Soest, The Netherlands

In the mid-eighties in the early days of my fern hobby I spent my holiday in the French Pyrenees, and of course looking for ferns. And there they grew in all shapes and sizes. Similarly *Phegopteris connectilis* was at several places and fairly large areas. This fern has a creeping rhizome and is mat forming.

Because there were many plants of this fern, I took a piece to take to my home garden in the Netherlands.

After planting, the fern settled soon and thrived. But it seemed not to be one species..... The second year after planting, I saw other fronds upcoming between the typical fronds of *Phegopteris connectilis*. They were fronds that I didn't recognize, but which were clearly different from the other one... and with a creeping rhizome too.

Whatever I tried at that time and in whichever fern books I searched for an explanation, I did not get the fern recognized or named. At first I thought it was because of my lack of

fern knowledge. And after a few years in which my fern knowledge was growing, I still couldn't explain the difference and came to the conclusion that it should be something special. My first thought was an intersection, a cross between *Phegopteris connectilis* and some other fern species, but which one???

I couldn't find out even by consulting the *Cystopteris* complex because the fern seemed to belong in there anyway. *Cystopteris* crossings from other continents were consulted too, but offered no solution either.

Did I discover a new species in Europe, perhaps on our planet??

Then I consulted Professor B. Hennipman † and he came to the cautious suggestion that it must be something special and could be a cross between *Cystopteris* and *Gymnocarpium*, an intersection between two kinds of species.

Further investigation had to be done with research at a level that I didn't have anyway. Unfortunately what was then called the National Herbarium (the Netherlands) and is now called NBC Naturalis, was unable or maybe unwilling to spend some time about this case.

The best thing I could do was to nurse and to grow it, do as much as possible to keep it alive and not let it die and show it to everybody and give a cutting to anybody who could find out something more that could be helpful to further the investigation.

The plant proved to be easy to keep alive. And after I separated it from the *Phegopteris connectilis*, the "new" fern proved to be very fast growing and to be very hardy too. Within a few years I had plenty to give away. In the meantime one member of the Nederlandse Varenvereniging did some sowing experiments which ended in no results at all. Although this "new" fern produces sori and spores, the spores appeared not to be fertile. A clear indication that it could be an intersection....

More than ten years later, since 1994 I was lucky to become a guest worker at the Hortus Botanicus in Leiden and succeeded in constructing a fern garden with a large collection of hardy ferns. In this fern garden this species grew very well too.

Because Martin Rickard – the former chairman of the BPS and well-known fern connoisseur - visited the Hortus in Leiden during that time, I could show him the plant. He was very surprised indeed and couldn't determine this fern either. So I gave him a piece for his own garden. After he had planted the fern in his garden Mr. Fraser-Jenkins visited. He was very curious and Martin gave him a piece too.

Fraser-Jenkins was the first fern specialist who was able to determine the identity of this fern. This fern was a hybrid between the genus *Cystopteris* and *Gymnocarpium* and more specifically a hybrid between *Cystopteris dickiana* and *Gymnocarpium robertianum*.

He came to this conclusion by consulting surprisingly the book "*Three hundred Indian Subcontinental Pteridophytes with a revised Census-list*" on the ferns of the Himalayas. He stored this find as far as I know in the Herbarium of Hong Kong by situating the origin in the Pyrenees, however on the wrong side, Spain.

He was so kind to name this find after me, unfortunately, he wrote the wrong name x *Cystocarpium roskumianum*. When I mailed him to thank him, I couldn't help but ask him to write my correct name too.

And of course he apologized and said he would try to effect a change. And although normally it is not possible, he managed to get through the right name x *Cystocarpium roskamianum*.

It is very special to get your name on a new fern species for an amateur fern enthusiast

x Cystocarpium roskamianum (see photo page 70) has been further distributed and is even back again in France in botanical gardens and in those of fern lovers.

It is a pity, the original location in the French Pyrenees is not known. In the first place, because I had no idea what I had brought with me and secondly because it was the beginning of my fern hobby and I had no idea that I should write the location where I took it; After all I thought it was a fairly common species, and there could be no need to further determining.

However, if this fern has just as much vigor in the wild as in the woodland garden, there could be a considerable growth of this hybrid too in the South Eastern Pyrenees anywhere and sooner or later it will be discovered again.

We will wait. Perhaps I will travel in that direction once again to discover it once again.

The history is not yet finished. In America there is and will be further cytological examination done on this fern, publishing of studies can appear any moment.

After that the final provisional chapter of this wonderful discovery can be written.

Dutch Fern Society Anniversary Tours

Bart Hendrikx

Weeret, The Netherlands

The Dutch fern society celebrated its 25th anniversary on August 16 2014. On Saturday August 16 we had the formal celebration with lectures, a fern exhibit, a fern shop and lots more. Besides many of our Dutch and Belgian members we were fortunate to welcome guests from the USA, UK, Germany, Switzerland and South Africa in the Hortus Botanicus botanical garden in Leiden. To make their journey worth while we were pleased to organise a 3 day tour from August 17 till August 19 across Dutch and Belgian gardens, a nursery and a fern rich site in the city of Rotterdam.

Fons Slot and I put a schedule together for the 3-day trip. Since our friends from the UK visited a number of wild sites in nature on a trip the year before, we now mainly focused on cultivated ferns.

On Sunday morning we gathered in the garden of our secretary, Annie de Pina, in



L- R, Fons Slot and Bart Hendricks
Photo courtesy of Loyd Jacobs

Moergestel, a small village in the Dutch countryside. In a period of only a few years she managed to built up a very nice collection of ferns mostly grown from spores and created her own stumpery, from tree stumps which she partly covered with soil. Species such as *Woodwardia unigemmata*, *Dryopteris kuratae* and a nice big patch of *Phegopteris connectilis* were mixed with all kinds of other ferns and shade loving perennials such as *Astilboides tabularis* and *Podophyllum*.

After a nice lunch we set of for the centre of Rotterdam to the Kralingse bos a completely manmade forest near the centre of the city. The forest, which is situated below sea level, was planted with both trees as well as a couple of fern species such as *Matteuccia struthiopteris* and *Dryopteris filix-mas*. Other fern species also colonized this area later on. Here we saw a terrestrial *Asplenium adiantum-nigrum* and *Asplenium trichomanes* and in a ditch there was an enormous *Cyrtomium fortunei*. And one fern belonging to the *Dryopteris affinis* conglomerate caused some discussion on its identity. The result of a closer examination by expert Tim Pyner was that it was a probable *Dryopteris affinis*.

The Monday had two very nice gardens in store. First we visited the garden of Dirk and Vera Ampe in Schoten (near Antwerp, Belgium). Dirk and Vera are very keen gardeners and grow a great number of plant species in their large garden. (see photo page 70) Besides their collection of shady plants they also have a large collection of hostas which are partly kept in pots on the driveway and even on the roof of a shed and of course a lot of fern species. Here we saw species such as *Blechnum mochaenum*, a crested *Blechnum penna-marina*, *Dryopteris celsa*, *Polystichum setiferum* 'Green Lace' and many more.

In the afternoon we visited the 2 hectares (9 acres) garden of Koen van de Berg in Westerlo, Belgium. Koen has one of the biggest private bamboo collections as well as an enormous number of *Acer palmatum* cultivars and an overwhelming number of other dendrological treats. His enormous *Phyllostachys kwangsiensis* and *P. parvifolia* were particulally impressive. We saw *Woodwardia unigemmata* and its undulate form, (see photo page 70) a hardy *Pyrrosia* from China, and a variety of *Dryopteris*, *Polystichum* and *Polypodium* species and cultivars such as *Polypodium australe* 'Cristatum old form'.

Tuesday morning we visited the wholesale nursery of Henk Braam in De Kwakel. We saw a large number of spore grown ferns such as *Microlepia strigosa*, *Woodwardia fimbriata*, *Dryopteris erythrosora* and *Cyrtomium falcatum*. Thousands and thousands of little spore grown plants waiting to be shipped abroad. They also own a large collection of *Nephrolepis* cultivars from which they grow new ones for the trade by tissue culture.

After visiting Braam we drove to the scenic village of Broek op Langedijk, and the garden of Rens Huiber. Rens had organized our lunch in a local restaurant near the water. After this lunch we were all invited for a trip by boat to take a look at the surroundings. Broek op Langedijk consists of thousands of man made small islands which were created to increase soil levels which dropped because of drainage and peat decay. The soils the people dug out of the canals was used to increase soil levels.

We had a small gap in between showers so we were able to see the area without any substantial rain. The rains came back again when we docked our boat at Rens' garden. Rens maintains the spore bank of the Dutch fern society. A part of his fern collection is kept on a small island in front of his house which we reached by a 4 meter (!) boat ride. (see photo page 71) We saw a large *Gymnopteris vestita*, *Polypodium* 'Ramosum Hillman', *Deparia pterorachis* and many more interesting plants. A number of *Pteridium*, *Equisetum* and *Hypolepis* species were kept in pots. A number of ferns were missing since Rens was responsible for building the fern display at our anniversary. Even so, there were lots to be seen. (see photo page 71)

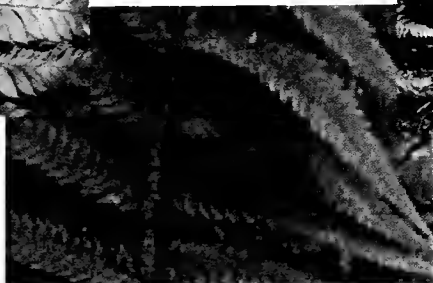
We think that both our anniversary as well as this three day tour were a success. It was a delight to meet so many fern enthusiasts who travelled such a long way to visit the Netherlands to celebrate our anniversary with us. We felt privileged to guide our guests through the gardens we visited together. We are very glad new contacts could be made and existing ones were strengthened. I hope we meet again soon.



Group on bridge over the canal at Rens Garden

L-R Paul Ripley, Loyd Jacobs, Sue Olsen, Martin Rickard, Jolanda Nel, Alan Nel, Heidi Kreis, Peter Kreis, Kent Kratz, Bart Hendrikx, Pat Acock, Fons Slot, Tim Pyner, Rens Huibers

Continued from page 69. L-R, *Polystichum acrostichoides* x *aculeatum*, *Polystichum* x *lesliei*, *Polystichum* x *potteri* and *Asplenium billotii* x *rhizophyllum*.



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If you would like to purchase one of the lovely fern t-shirts from the Netherlands Fern Society Jubilee Anniversary they can be found at -

<http://www.varenvereniging.nl/>

They carry a large assortment of very high quality shirts!



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